

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2004/006849

International filing date (day/month/year)
24.06.2004

Priority date (day/month/year)
27.06.2003

International Patent Classification (IPC) or both national classification and IPC
H01M4/88, H01M8/10

Applicant
UMICORE AG & CO. KG

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/006849

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing:
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/006849

Box No. V Reasoned statement under Rule 43b/s.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	5
	No: Claims	1-4,6-20
Inventive step (IS)	Yes: Claims	
	No: Claims	1-4,6-20
Industrial applicability (IA)	Yes: Claims	1-20
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Cited documents

D1: US2002/064593

(especially [0003]; [0019] - [0032]; [0055]; [0062] - [0068]; figure 3; claim 18)

D2: JP2001160405

(especially [0001]; [0005]-[0008]; [0010]; [0013]; [0014]; [0019]; [0020]; [0024]; [0025];
[0027]; [0029]-[0037]; claims 1, 4, 5)

2. Summary

The application relates to the manufacture of a 3-layer catalyst coated polymer electrolyte membrane wherein the polymer electrolyte membrane is connected with at least one supporting foil during all coating steps.

3. Novelty, Article 33(2) EPC

3.1 Document D1 discloses a continuous process for the manufacture of a membrane electrode assembly. The problem to be solved is the provision of a reliable process with which polymer electrolyte membranes, in particular with a thickness smaller than 50 μm can be processed to give membrane electrode assemblies.

During the coating of the catalyst ink to one surface of the polymer electrolyte membrane, the opposite surface of the membrane is supported by a backing foil which is laminated thereon (figure 3; [0062] - [0068]). The polymer electrolyte membranes consist e. g. of Nafion, doped polybenzimidazol or sulfonated polyether ketones ([0003]) and they have a thickness between 10 and 200 μm . The second surface of the polymer electrolyte membrane is supported by a backing film, made for example from polyester. The thickness

of the backing film is between 50 to 100 μm ([0020]). The first surface of the polymer electrolyte membrane is coated in a continuous process with the catalyst ink, for example by means of printing, brushing or spraying ([0019]; claims 1, 2, 17, 19). Then, the catalyst coated first surface of the membrane is coated with a gas distribution layer (figure 3; [0021] - [0028]). Then, the backing film is removed from the second surface of the membrane and this surface is then coated also in a continuous process with the catalyst ink and the second gas diffusion layer with the first gas diffusion layer serving as a backing layer. In a special embodiment, after having coated the first surface of the membrane, the composite may be dried at 50 - 100 $^{\circ}\text{C}$ ([0025]-[0029]). The coated polymer electrolyte membrane may be post-treated in water at elevated temperatures, preferably at 80 $^{\circ}\text{C}$ ([0029]; claim 18). Thus, a 3-layer catalyst coated membrane is produced by an apparatus comprising means for supporting the polymer electrolyte membrane with at least one supporting foil during all processing steps (figure 3; claim 22). The membrane electrode assemblies may be used for fuel cells (claim 23).

Consequently, document D1 takes away the novelty of claims 1-4, 6-13, 15, 16, 18-20.

3.2 Document D2 relates to a process for manufacturing a 3-layer catalyst coated polymer electrolyte membrane. The problem to be solved is to provide a manufacturing method for the application of a catalyst containing ink on the front and back side of a polymer electrolyte membrane without causing wrinkles ([0005]-[0007]).

The front side of a supported polymer electrolyte membrane having a first supporting foil on its back side is coated with a catalyst layer and dried. A second supporting foil is applied to the front side of the polymer electrolyte membrane and the first supporting foil is removed from the backside. Then, the back side of the polymer electrolyte membrane is coated with a catalyst layer and dried. Afterwards, the second supporting foil is removed ([0008]; [0013]; [0024]; [0025]; [0030]-[0037]; claim 1; claim 5). The coating of the catalyst ink may be carried out by screen printing ([0020]). The supporting foil is fixed to the membrane by a lamination process (claim 2; [0030]). An adhesive may be applied between the supporting foil and the membrane [0010]. The thickness of the supporting foil amounts to 50-250 μm , e. g. 100 μm ([0014]; [0030]) and may be made from PET, polyolefine, tetrafluoroethylene / ethylene copolymer or polyimide ([0017]). The thickness of the ion exchange resin amounts, for example, to 50 μm ([0030]) and comprises perfluorinated

sulphonic acid compositions ([0027]; [0030]; [0032]). The drying time with air ranges from 10 s to 3 hours, preferably 5 minutes ([0019]; [0033]; [0035]), at temperatures ranging from ambient temperature to 180 °C (claim 4; [0030]-[0035]). The membrane electrode assemblies may be applied for polymer electrolyte fuel cells ([0001]; [0029]).

Consequently, claims 1-4, 6-14 and 16-20 are not novel in view of document D2.

4. Further remarks

4.1 The requirements of Rule 5.1 a) (ii) are not met, as the documents D2 and D2 are not identified in the description and the relevant background art disclosed therein is not briefly discussed.